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PATENT

Atty. Dkt. No. NVDA/P000723

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Gao, et al.

Serial No.: 10/767,462

Confirmation No.: 3598

Filed: January 28, 2004

For: System for Cooling a Processor while Reducing Air Flow Noise

§ Group Art Unit: 2835

§ Examiner: Boris Chervinsky

MAIL STOP APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

CERTIFICATE OF MAILING
37 CFR 1.8

I hereby certify that this correspondence is being deposited with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on November 20, 2006.

Kenyon Y. Ripple — Typed Name
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AMENDED APPEAL BRIEF

In response to a Notification of Non-Compliant Appeal Brief mailed November 15, 2006, Appellants submit this Amended Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 2835 dated April 10, 2006 finally rejecting claims 1-10, 17, and 18. The final rejection of claims 1-10, 17, and 18 is appealed. This Amended Appeal Brief is believed to be timely since mailed within the longer of one month or thirty days from the mailing date of the Notification of Non-Compliant Appeal Brief. Although Appellants believe there are not fees due in connection with this Amended Brief, the Commissioner is hereby authorized to charge counsel's Deposit Account No. 20-0782/NVDA/P000723/JC for any fees, including extension of time fees or excess claim fees, required to make this Amended Appeal Brief timely and acceptable to the Office.

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Real Party in Interest

The present application has been assigned to NVIDIA Corporation, 2701 San Tomas Expressway, Santa Clara, California 95050.

Related Appeals and Interferences

Appellants assert that no other appeals or interferences are known to the Appellants, the Appellants' legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1-10, 17, and 18 are pending in the application. Claims 11-16 and 19-21 have been canceled without prejudice. Claims 1-10, 17, and 18 stand finally rejected as discussed below. The final rejections of claims 1-10, 17, and 18 are appealed. The pending claims are shown in the attached Claims Appendix.

Status of Amendments

A minor amendment to claim 1 was proposed after the final rejection but was not entered.

Summary of Claimed Subject Matter

In independent claim 1, a system for cooling a processor (Abstract) includes a heat sink assembly (*see*, page 6, lines 2-5, and *e.g.*, Figures 1 and 2 reference number 104) and a heat sink lid (*see*, page 6, lines 1-10 and *e.g.*, Figures 4 and 5 reference number 400). As illustrated in Figures 1 and 2, the heat sink assembly has a fan (reference number 106), a plurality of fins (reference number 109), and a bottom surface (reference number 111). The plurality of fins and at least a portion of the bottom surface define air channels (*see*, page 6, lines 15-21 and *e.g.*, Figures 1, 2, 3, and 5, reference number 108). The heat sink assembly is disposed onto a processor (*see*, page 2, lines 6-9, page 7, lines 4-8 and *e.g.*, Figure 1 reference number 112). The heat sink lid is coupled to the heat sink assembly such that the heat sink lid only covers a portion of the air channels proximate the fan (*see*, page 6, lines 3-5, page 6, lines 13-14. and *e.g.*, Figures 4 and 5). The heat sink lid is configured such that air flows directly from the fan along the bottom surface of the heat sink assembly (*see*, page 6, lines 15-17, and *e.g.*, Figure 5). The length of at least one fin of the plurality of fins is equal to or greater than the length of the processor (*see*, page 6, lines 13-14, and *e.g.*, Figure 5).

In dependent claim 3, the uncovered portion of the air channels reduces air flow noise in the system during operation (*see*, page 6, lines 21-25, and *e.g.*, Figure 5). In dependent claim 4, the reduction in air flow noise is achieved by preventing the formation of a standing wave within the air channel during operation. (*see*, page 6, lines 21-25, and e.g., Figure 5).

Grounds of Rejection to be Reviewed on Appeal

1. Claims 1, 3-7, 9, 17, and 18 are rejected under 35 USC §103(a) as being unpatentable over U.S. Patent Number 6,697,256 issued to Horng in view of U.S. Patent Number 6,311,767 issued to Inoue or alternatively in view of U.S. Patent Number 6,778,390 issued to Michael.

2. Claim 2 is rejected under 35 USC §103(a) as being unpatentable over Horng, in view of Inoue, and further in view of U.S. Patent Number 5,838,066 issued to Kitajo.

3. Claims 8 and 10 are rejected under 35 USC §103(a) as being unpatentable over Horng in view of Inoue.

ARGUMENTS

I. **The Examiner erred in rejecting claims 1, 3-7, 9, 17, and 18 under 35 USC §103(a) as being unpatentable over Horng in view of Inoue or alternatively Michael.**

In the Final Office Action, the Examiner states that Horng discloses the claimed invention except leaving a portion of the air channel uncovered by the lid and at least one fin having a length greater than the length of the processor. To compensate for Horng's lack of disclosure with regard to the fin length, the Examiner dismisses the fin length limitation as an obvious matter of design choice. To compensate for Horng's lack of disclosure with regard to the uncovered air channel (now recited as the heat sink lid only covering a portion of the air channels proximate the fan in claim 1), the Examiner combines Horng with Inoue or alternatively Michael. Regarding the combination with Inoue, the Examiner cites FIG. 1 of Inoue as providing the missing teaching to modify Horng's lid. To support this combination, the Examiner asserts a reduction in air pressure at the end of the channel and a dissipation of heat in more than one direction as benefits of making the combination. Regarding the combination with Michael, the Examiner cites FIG. 3 of Michael as providing the missing teaching to modify Horng's lid. The Examiner uses the same motivation to combine to support the combination of Horng and Michael. As discussed below, Appellants submit that these statements are incorrect and result in an improper obviousness rejection of the claims.

Horng and Inoue fail to teach, suggest, or disclose a fin having a length equal to or greater than a length of the processor, as recited in the claims. Horng illustrates a processor 12 having a length and width (about 1.75 inches measured from FIG. 1, 2, and 5). The longest fin shown in Horng's figures is clearly less than the length of the processor (about 1.25 inches measured from FIG. 1, 2, and 5). The length of Inoue's fins 22 roughly correspond to the diameter of the heat pipe 20 and are thus much shorter than the processor. In computer hardware design, space is always a critical issue. Arbitrarily changing the length of a component may potentially have adverse

effects on the space requirements of a particular design. Further, the length of a fin relative to a processor that a heat sink assembly is designed to cool impacts the cooling capacity of the heat sink assembly. For these reasons, a fin length is not an obvious design parameter that can be arbitrarily increased or decreased, as the Examiner has suggested in his arguments. The fact is that neither Horng nor Inoue teaches or suggests that the fin length of the heat sink assembly is or should be equal to or greater than the length of the processor that the heat sink assembly is designed to cool. Therefore, the combination of Horng and Inoue does not render the pending claims obvious.

Horng and Michael fail to disclose the air channel of a heat sink assembly which is proximate the fan and partially uncovered, as recited in the claims. As stated above, Horng does not disclose leaving a portion of the air channel uncovered by the lid. The only air channels in Michael that are partially uncovered are the air channels of the heat sinks 305 and 307, which are for cooling the memory chips 121. The uncovered portions of the air channels of heat sinks 305 and 307, as clearly shown in the Figures, are distal from the fan, not proximate, as recited in the pending claims. Therefore, any combination of Horng in view of Michael fails to disclose a heat sink lid coupled to the heat sink assembly, wherein the heat sink lid only covers a portion of the air channels proximate the fan. For this reason, the combination of Horng and Michael does not render the claims obvious.

Further to all of this, none of the references cited by the Examiner mention noise reduction or preventing a standing wave as recited in claims 3-5. Thus, these references cannot be used to render the pending claims 3-5 obvious.

In addition to the foregoing, the Examiner has cited insufficient motivation to combine Horng with either Inoue or Michael. Inoue and Michael both teach away from the limitation recited in claim 1 of a heat sink lid covering only a portion of the air channels proximate the fan. As discussed in greater detail below, Inoue and Michael both teach cooling systems having improved cooling efficiency; whereas the present invention makes a tradeoff between cooling efficiency and noise reduction.

Inoue discloses a computer fan assembly 10 configured to satisfy the confined space requirements of and to provide adequate cooling capacity for a laptop CPU 78.

Inoue uses an oil filled heat pipe 20 to transfer heat from laptop CPU 78 to cooling system 10. Inoue discloses some embodiments where the lid 36 covers most of the air channels 58 (e.g., FIGS. 1 and 4) and other embodiments where a smaller portion of the air channels 58 is covered (e.g., FIG. 5). However, Inoue is completely silent regarding why the air channels are or are not covered and provides absolutely no teaching of any benefit that having uncovered air channels would provide. Inoue certainly does not mention noise reduction, which is why the air channels are uncovered in the present invention. Without any type of teaching with respect to the benefits of air channels, how could one skilled in the art be motivated to modify the system in Horng to introduce partially uncovered air channels, as the Examiner argues? Applicants contend that because there are no teachings in Inoue as to why the air channels are partially covered and certainly no teachings as to why only the portion of the air channels proximate to the fan should be covered, as recited in the pending claims, that there is no motivation to combine Horng and Inoue, in the manners suggested by the examiner.

Michael suffers from the same problem as Inoue. Michael discloses a cooling system configured not only to ensure a graphics processor 119 is adequately cooled, but also to ensure that associated memory chips 121 are adequately cooled. As discussed above, Michael discloses only one embodiment in which a slight portion of a memory heat sink unit is uncovered. However, Michael never provides any teachings about why part of the memory heat sink is uncovered and never attributes any significance to the fact that a portion of the memory heat sink is uncovered in one of his embodiments. By contrast, referring to FIGS. 7A and 7B and the accompanying description thereof in the specification (col. 8, line 48-col. 9, line 22), Michael emphasizes the different configurations of the barriers 405, 703, 707, 709, and 711, rather than the fact that the edge 313A covers all portions of the memory sinks 305, 307 in FIG. 7A and that the edge 313B leaves a slight portion of the memory sinks 305, 307 uncovered in FIG. 7B. Like Inoue, Michael does not articulate any technical reason, such as reducing noise, for having partially uncovered air channels. Therefore, without some sort of express teaching, one skilled in the art simply would not be motivated to

modify Horng with the teachings of Michael, as the Examiner attempts to do. Thus, there cannot be a motivation to combine Horng and Michael, as the Examiner suggests.

Additionally, the teachings of both Inoue and Michael teach away from the system recited in the pending claims. For this reason also, the combinations argued by the Examiner should fail. More specifically, Inoue requires improved cooling efficiency so that his cooling system may adequately cool a CPU in the confines of a laptop. Michael requires improved cooling efficiency so that his cooling system may adequately cool a high-power graphics card in the confines of an AGP slot. In sharp contrast, the heat sink lid recited in claim 1 is specially configured to reduce noise by eliminating the reflective surface that would otherwise intensify sound waves propagating through the air channels. However, reducing the size of the heat sink lid to cover only a portion of the air channels, while reducing noise, also reduces the cooling efficiency of the system disclosed in the present application. The references cited by the Examiner support this point. For example, Michael explains the benefit of a lid covering the air channels as follows:

> Top 311 improves air flow specifically over heat sinks 305 and 307 by restricting the flow to remain near card 101, especially near the memory chips 121. As noted previously, the presence of the chips protruding from card 101 disturbs the flow. It has been found by the inventor of this invention that in some cases the flow separates from card 101 or recirculates, locally decreasing the heat transfer and resulting in a global variation in heat transfer, for example from chip to chip. Top 311 forces the flow to remain near chips 121 and inhibits the formation of recirculating flow. The result is improved uniformity and heat transfer predictability.

(Col. 8, lines 35-47, emphasis added). In short, the invention recited in the pending claims is an optimized design that recognizes the tradeoff between noise reduction and cooling efficiency. None of the cited references contemplates the problem of noise reduction, and certainly none addresses or recognizes the tradeoff made by the present invention. Since the teachings and goals of both Inoue and Michael point to ways to increase cooling efficiency, these references teach away from the design choice made by the present invention. Thus, these references cannot be used to render the pending claims obvious.

Also, this section of Michael further supports the Applicants' argument that persons skilled in the art would not simply shorten the lid covering the air channels of a

heat sink assembly, without a specific reason for doing so, since such a design modification would decrease cooling effectiveness. Again, as argued above, since neither Inoue nor Michael provides a specific reason for shortening the heat sink lid, there simply is no motivation for one skilled in the art to shorten the lid disclosed in Horng based only on a couple of drawings, with no accompanying text, in the Inoue and Michael references. In sum, when viewing either Inoue or Michael in light of Horng, it is difficult to arrive at the present invention. Horng teaches an improved fastener for attaching a lid and a fan-sink to a motherboard. Horng teaches no improvement in operation of the cooling system. The end benefit is a less expensive manufacturing process. There is little in common between Horng and either Inoue or Michael. The Examiner cites reduction of air pressure at the end of the channel and multi-directional dissipation of heat as motivations to combine the different references. Respectfully, Applicants believe that air pressure reduction and multi-directional heat dissipation will lead to a less efficient cooling system rather than a more efficient system. For example, in distinguishing a prior art system, Michael again, states:

> This flow pattern has several adverse consequences, including having only a portion of the flow available to cool memory chips 121, providing uneven cooling between chips or along heat sink 123, and the possibility of allowing for flow separation or recirculation near the chips.

(Col. 3, lines 19-24). Thus, the combination suggested by the Examiner, for the reasons proffered by the Examiner, would produce a less efficient cooling system, something that is in direct contravention with the teachings of both Inoue and Michael. For this exact reason, Applicants contend that without a specific teaching in either Inoue or Michael as to why leaving a portion of the air channels uncovered would be desirable, one skilled in the art would have no real motivation to modify Horng in such a fashion.

Based on the foregoing, Applicants submit the combination of Horng with Inoue or Michael is improper. Withdrawal of the rejection is therefore respectfully requested.

II. **The Examiner erred in rejecting claim 2 under 35 USC §103(a) as being unpatentable over Horng in view of Inoue, in further view of Kitajo.**

Claim 2 is rejected under 35 USC §103(a) as being obvious over Horng in view of Inoue and Kitajo. Kitajo adds nothing that would cure the deficiencies of any of Horng and Inoue, discussed above. Withdrawal of the rejection is respectfully requested.

III. **The Examiner erred in rejecting claims 8 and 10 under 35 USC §103(a) as being unpatentable over Horng in view of Inoue.**

Claims 8 and 10 are rejected under 35 USC §103(a) as being obvious over Horng and Inoue. As discussed above, the combination of Horng with Inoue is improper. Withdrawal of the rejection is respectfully requested.

CONCLUSION

The Examiner errs in rejecting claims 1-10, 17, and 18. The claims are not obvious in view of the cited references alone or in combination. Therefore, the Appellants respectfully request that the rejections be vacated in order for the application to proceed to allowance.

Respectfully submitted,

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CLAIMS APPENDIX

1. A system for cooling a processor, the system comprising:

the processor;

a heat sink assembly having a fan, a plurality of fins, and a bottom surface, wherein the plurality of fins and at least a portion of the bottom surface define air channels, and the heat sink assembly is disposed onto the processor; and

a heat sink lid coupled to the heat sink assembly, wherein:

the heat sink lid only covers a portion of the air channels proximate the fan,

the heat sink assembly is configured such that air flows directly from the fan along the bottom surface of the heat sink assembly, and

the length of of at least one fin of the plurality of fins is equal to or greater than the length of the processor.

2. The system of claim 1, further comprising a thermal adhesive disposed on an outer surface of the heat sink assembly for thermally coupling the heat sink assembly to the processor.

3. The system of claim 1, wherein the uncovered portion of the air channel reduces air flow noise in the system during operation.

4. The system of claim 3, wherein the uncovered portion of the air channel reduces air flow noise by preventing the formation of a standing wave within the air channel during operation.

5. The system of claim 4, wherein the uncovered portion of the air channel prevents the formation of the standing wave by preventing the reflection of an incident wave propagating within the air channel during operation.

6. The system of claim 1, wherein the heat sink lid includes an edge configured to reduce turbulent flow of air escaping from the air channel and flowing across the edge.

7. The system of claim 6, wherein the edge is substantially perpendicular to a direction of air flow within the air channel.

8. The system of claim 1, wherein the processor comprises a graphics processing unit.

9. The system of claim 1, wherein the processor comprises a central processing unit.

10. The system of claim 1, wherein the processor comprises an application-specific integrated circuit.

17. The system of claim 1, wherein the heat sink assembly further has a wall and the heat sink lid is directly coupled to the wall.

18. The system of claim 1, wherein the bottom surface is substantially flat.

EVIDENCE APPENDIX

There is no evidence attached.

RELATED PROCEEDINGS APPENDIX

Since there are no related proceedings, no copies of decisions rendered are included.